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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,214	03/31/2004	Vincent P. Nero	25191-00043	6001

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EXAMINER

SINGH, PREM C

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 06/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/814,214

Applicant(s)

NERO ET AL.

Examiner

Prem C. Singh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 07/12/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The application not only deals with the pretreatment of the hydrocarbon feed prior to oxidative desulfurization, but also deals with the oxidative desulfurization.

The following title is suggested:

"Acid treatment and oxidative desulfurization of hydrocarbon feed stocks".

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, in figure 1, water stream (108) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Specifications mention Figure 3(a) and Figure 3(b) (Page 3, paragraph 12, 13). But there are no such drawings submitted with the application.

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Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanhofer (US Patent 2,336,736) in view of Rappas et al (US Patent 6,406,616).

Claims 1 and 13.

Kanhofer invention discloses, "A process for converting low-boiling hydrocarbon distillates into stable gasoline of low olefin content with high antiknock value." (Page 1, column 1, lines 1-3). "When the higher boiling fractions of cracked gasolines are to be

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used in aviation gasoline, however, it is necessary to remove a part or all of the olefin hydrocarbons present by treating the higher boiling fraction of gasoline with a sufficient quantity of relatively concentrated sulfuric acid to effect a substantial reduction in the olefin content thereof. The preferred range is of the order of 90-100%." (Page 2, Column 1, lines 69-75; column 2, lines 1-5). "The high boiling fraction was contacted with 10 pounds per barrel (3.56 vol %, assuming a specific gravity of 0.8 for the hydrocarbon) of 98% sulfuric acid." (Page 3, column 1, lines 3-5). "After the contacting is complete, the acid and hydrocarbon mixture are separated. The reactions involved in the acid treatment are not known with any degree of certainty, because of their complexity." (Page 2, column 2, lines 19-27).

It is to be noted that polyene compounds comprise mono-, di-, and polyolefins.

Kanhofer does not specifically mention about the products of reaction of the sulfuric acid and the hydrocarbon.

Kanhofer does not specifically mention oxidizing the sulfur in the hydrocarbon phase.

Rappas invention discloses, " It has been discovered that the fuel products, such as gasoline and diesel fuel can be economically treated to reduce sulfur content to an amount of 5 to 15 ppm and not diminish the octane rating of the fuel product. In practicing the process of present invention, the hydrocarbon fuel containing low amounts of organic sulfur compounds is treated with an oxidizing solution." (Column 3, lines 25-35). "Once the extract containing the oxidized sulfur compounds is separated

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from the desulfurized hydrocarbon fuel, or raffinate, the extract can be treated to recover the acid for recycle." (Column 4, lines 15-19).

Rappas further discloses, "The invention is properly most useful for hydrocarbon fuels ready for market than for removal of sulfur from crude oil containing gross amounts of sulfur." (Column 5, lines 45-50). "This invention oxidizes almost quantitatively, organic sulfur compounds when polishing commercial diesel fuel, gasoline, kerosene, and other light hydrocarbons which have been refined, normally after hydrogenation step in a hydrotreater where sulfur compounds are reduced and removed having a small number of sulfur species which are hydrogenated with considerable difficulty." (Column 6, lines 36-44).

Since Rappas teaches an oxidative treatment of gasoline to further remove sulfur compounds, it would have been obvious to one skilled in the art at the time the invention was made to combine the teachings of Kanhofer and Rappas inventions and take a hydrocarbon stream with olefins and sulfur impurities, treat with H_2SO_4 , per Kanhofer and thus remove the olefins, and further treat with an oxidizing solution to finally produce a gasoline and/or diesel fuel with reduced olefin and sulfur content without any octane loss and thus improve the product quality economically.

Claims 2 and 17.

Kanhofer discloses, "The high boiling fraction was contacted with 10 pounds per barrel of 98% sulfuric acid." (Page 3, column 1, lines 3-5). This is equivalent to 3.56 vol %, assuming a specific gravity of 0.8 for the hydrocarbon.

Claims 3 and 18.

Kanhofer discloses, "The preferred range of acid is of the order of 90-100%." (Page 2, column 2, lines 4-5).

Claims 4 and 14.

Rappas invention discloses, " In practicing the process of present invention the hydrocarbon fuel containing low amounts of organic sulfur compounds is treated with an oxidizing solution containing hydrogen peroxide, formic acid and a maximum of about 25% water. The amount of hydrogen peroxide in the oxidizing solution is greater than about two times the stoichiometric amount of peroxide necessary to react with the sulfur in the hydrocarbon fuel." (Column 3, lines 30-39). The molar ratio of formic acid to hydrogen peroxide useful in the practice of this invention is at least 11 to 1." (Column 5, lines 30-32). "The reaction is carried out at a temperature ranging from about 50°C to 130°C." (Column 3, lines 42-44). "Some of the oxidation products, usually the corresponding organic sulfones, become soluble in the oxidizing solution, and, therefore, may be removed from the oxidized fuel by a subsequent phase separation step. The aqueous phase is removed from the hydrocarbon phase now having a

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reduced sulfur content." (Column 3, lines 57-62). "The aqueous phase is flash distilled to remove the water and acid overhead while transferring and leaving the sulfur-containing compounds in the gas oil stream at the bottom of the distillation column. The overhead stream containing acid and water from the flash distillation tower is further distilled in a separate column. The acid recovered can then be returned to the oxidizing solution." (Column 4, lines 29-37).

Claim 5.

Rappas invention discloses, "Hydrogen peroxide concentration in its broadest sense being from about 0.5 wt% to about 4 wt%. (Column 3, lines 40-42). "The oxidation/extraction solution used in the present invention will contain from about 75 wt% to about 92 wt% formic acid." (Column 5, lines 26-29).

Claim 6.

Rappas invention discloses, "The amount of oxidizing solution should be such that it contains at least about two times the stoichiometric amount to react the sulfur present in the fuel, preferably from about two to about four times. Greater amounts could be used." (Column 5, lines 54-58).

Claims 7-10.

Rappas invention discloses, "After separation, the hydrocarbon feed may be contacted with a caustic solution, or with anhydrous calcium oxide and/or passed

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through filtering devices to neutralize any trace acid remaining and to make a final dehydration of the hydrocarbon fuel." (Column 4, lines 42-50). "Some caustic or calcium oxide may be added to the fuel through line (44). Use of dry calcium oxide would not only neutralize residual acid, but would also serve to dehydrate the fuel. Use of quicklime is technically preferred to neutralization by washing with caustic solution followed by salt drying. Any solids present exit post-treatment vessel (42) through line (43) for appropriate use or disposal." (Column 9, lines 35-56).

Claim 11.

Kanhofer invention discloses, "The sulfuric acid may be recovered by well known methods and re-used where this is economical." (Page 2, column 2, lines 33-35).

Claim 12.

Rappas invention discloses, "The fuel product exits the flash drum (36) through line (38) as shown in Figure 1, is cooled in heat exchanger (40) for subsequent filtering or treatment in holding tank (41) to remove any residual water, acid, or trace sulfur compounds which may remain that are subject to removal." (Column 9, lines 30-34).

Although Rappas does not specifically mention about a coalescer, it would have been obvious to add a coalescer before the holding tank (41) to improve the separation and subsequent filtration.

Claim 15.

Kanhofer does not specifically mention using spent sulfuric acid from an alkylation process.

It would have been obvious to one skilled in the art to use a spent sulfuric acid stream from an alkylation process and thus reducing the amount of fresh acid requirement and making the overall operation more economical.

Claims 16 and 19.

Kanhofer discloses, "Any suitable method of contacting the gasoline with the acid may be used, and since such methods are well known, there is no need to describe them in detail." (Page 2, column 2, lines 5-8). Kanhofer further discloses, "Contact is preferably carried out at 0°F to 80°F." (Page 2, column 2, lines 9-11).

Kanhofer does not specifically mention about the pressure during contacting.

Kanhofer does not specifically mention the residence time needed for converting the polyene compounds to organic sulfate compounds.

It would have been obvious to one skilled in the art to use a pressure from about 10 to 50 psi and a residence time of less than about 5 minutes for an effective contacting of the gasoline and sulfuric acid, to carry out the reactions properly, and to remove olefinic compounds effectively.

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Brooke et al, US Patent 2,465,964.

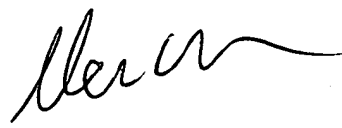
Scheeline et al (US Patent 2,407,386).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 6:30 Am-3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ps/060606


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